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Role of de novo biosynthesis in ecosystem scale monoterpene emissions from a boreal Scots pine forest

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Monoterpene emissions from Scots pine have traditionally been assumed to originate as evaporation from specialized storage pools. More recently, the significance of de novo emissions, originating directly from monoterpene biosynthesis, has been recognized. To study the role of biosynthesis in the ecosystem scale, we measured monoterpene emissions from a Scots pine dominated forest in southern Finland using the disjunct eddy covariance method combined with proton transfer reaction mass spectrometry. The interpretation of the measurements was based on a hybrid emission algorithm describing both de novo and pool emissions. During the measurement period May–August 2007, the monthly medians of daytime emissions were 170, 280, 180, and 180 μg m^{-2} h^{-1}. The emission potential for both de novo and pool emissions exhibited a decreasing summertime trend. The ratio of the de novo emission potential to the total emission potential varied between 30% and 46%. Although the monthly changes were not significant, the ratio always differed statistically from zero, i.e. the role of de novo biosynthesis was evident. The hybrid approach showed promising potential for the improvement of the ecosystem scale emission modelling. Given this feature and the significant role of biosynthesis, we recommend incorporating both de novo and pool emissions into the monoterpene emission algorithms for Scots pine dominated forests.